

## **Protocol for Lead Sampling and Assessment in Homes and Soils in Flint Michigan**

This protocol specifically outlines a methodology for sampling interior/exterior paint and exterior soils at the selected homes.

### The X-Ray Fluorescence (XRF) Sampling Method

The x-ray fluorescence (XRF) sampling/analytical method will be used to quantify lead levels in interior/exterior painted surfaces and exterior soils. XRF sampling of water service lines and potable water fixtures may also be conducted, depending on accessibility. An individual XRF measurement is a scan that requires only a few seconds. Portable XRF instruments expose the media sample to x-rays or gamma radiation, which causes lead to emit x-rays with a characteristic frequency or energy. The intensity of this radiation, which is proportional to lead concentration in the substrate, is measured by the instrument. LBP concentrations are reported as both mg/cm<sup>2</sup> and ppm; soil concentrations are reported in ppm, and lead concentrations in piping are reported as %. Only XRF instruments that have a HUD/EPA-issued Performance Characteristic Sheet will be used in this survey. XRFs will be used in accordance with the manufacturer's instructions and the XRF Performance Characteristic Sheet.

The consultants and investigators will wear radiation dosimeters to measure their radiation exposure, although exposures are generally extremely low if the XRF instruments are used in accordance with the manufacturer's instructions. If feasible, persons should not be near the other side of a wall, floor, ceiling, or other surface being tested. The shutter of an XRF should never be pointed at anyone, even if the shutter is closed.

It is important to note that the XRF method is not routinely used to quantify lead in house dust samples (due to insufficient sample size). As described below, house dust samples will be collected and will be analyzed by a certified laboratory.

### Sampling Consultants and Study Investigators

The study investigators will be selected by representatives of Veolia North America (VNA), in collaboration with the City of Flint. The study investigators will have prior experience with surveys of lead-containing media at residential locations. Lead-certified inspectors (outside the Flint city limits) that are certified for lead- XRF investigations of LBP, soils and indoor plumbing (the "sampling consultants") will be selected by VNA. The selected firm will also have experience collecting house dust and paint chip samples. The study investigators will review and approve the standard operating procedures (SOPs) and field survey forms used by the sampling consultants. SOPs will include XRF-instrument calibration, sampling technique, and results documentation (sample ID, time and location of sample collection, measured lead value, chain of

custody forms, etc.). Sampling consultants will also be responsible for all health and safety issues associated with LBP home investigations including the use of the XRF instrument.

Homes selected for sampling, sample locations at those homes, and number of samples collected per residence will be at the discretion of the study investigators.

#### General survey design

Several regulatory guidance documents (Michigan DHHS, HUD, EPA) prescribe procedures for conducting lead investigations of homes with LBP (the State of Michigan references the HUD Guidelines as one of their four accepted sampling methodologies (MDCH 2007). The methodology and approach described herein is generally consistent with the intent of these guidance documents but the proposed protocol does not strictly adhere to or attempt to fulfill the requirements of any of these regulatory programs. Because XRF provides real-time, in-field measurements, the survey approach is intended to be relatively "flexible", i.e., decisions in the field (based on visual assessment and preliminary XRF readings of painted surfaces and exterior soils) will largely guide the investigation.

Each of the selected residences will be evaluated, irrespective of the construction period of the individual residential unit. Generally, the proposed investigation will proceed as follows:

#### *Photo Log*

One or more photographs shall be taken with a GPS-enabled device or smartphone that show the house front door and (where possible) house or unit number. At least one photograph's metadata, or at least one photograph's filename will be recorded in an Excel spreadsheet, with columns that include the house or unit address.

#### *Visual Assessment*

A visual assessment will be conducted throughout each home to determine the size and instances of paint details such as (but not limited to): deteriorated paint, friction surfaces, chewed surfaces, deteriorated substrate conditions and bare soil on the exterior. The visual assessment will also include the location and accessibility of the water service line within the home as well as noting any potable water fixtures that appear to be brass-containing.

#### *Interior paint*

In each room, each wall and each painted surface will be initially scanned via XRF. Sample location will be at the direction of the investigator and pursuant to HUD guidelines 7-22 "*XRF testing is required for at least*

*one location per testing combination, except for interior and exterior walls, where four readings should be taken, one on each wall." "Certain building components that are adjacent to each other and not likely to have different painting histories can be grouped together into a single testing combination, as follows:*

*+ Window casings, stops, jambs and aprons are typically a single testing combination + Interior window mullions and window sashes are a single testing combination - do not group interior mullions and sashes with exterior mullions and sashes + Exterior window mullions and window sashes are a single testing combination + Door jambs, stops, transoms, casings and other door frame parts are a single testing combination*

*+ Door stiles, rails, panels, mullions and other door parts are a single testing combination*

*+ Baseboards and associated trim (such as quarter-round or other caps) are a single testing combination (do not group chair rails, crown molding or walls with baseboards)*

*+ Painted electrical sockets, switches or plates can be grouped with walls*

*Each of these building parts should be tested separately if there is some specific reason to believe that they have a different painting history. In most cases, separate testing will not be necessary."*

Per regulatory guidance documents, targeted wooden surfaces should include, but not be limited to:

- Window casings, stops, jambs and aprons
- Window mullions and window sashes
- Door jambs, stops, transoms, casings and other door frame parts
- Door stiles, rails, panels, and mullions
- Baseboards and associated trim (such as quarter-round or other caps)

An additional XRF reading (two total) will be taken of each surface in the room that is determined to have LBP. Per the EPA (EPA 2001), LBP will be defined as paint containing > 5,000 ppm lead (0.5%) or 1 mg/cm<sup>2</sup> in the XRF scan (SOM 2015) All surfaces determined to have LBP will be photographed. If a home is determined to have interior LBP, then attempts will be made to collect paint chip samples from different deteriorated LBP surfaces in the home if available and accessible. Paint chips will only be collected if the paint is already flaking or chipping. These samples will be stored and may be analyzed at a later date.

#### *Exterior paint*

One XRF scan of each exterior painted wall and exterior surface (e.g., door, porch railings and window frames) will be taken, depending on ease of accessibility. Accessibility is at the discretion of the investigator, i.e., if the unit is not on the ground floor and the windows cannot be opened from within,

then a particular surface may not be sampled. An additional XRF reading (two total) will be taken of each painted surface determined to contain LBP. Other painted structures (sheds, fences, etc.) may also be evaluated at the discretion of the study investigator.

#### *Water service line*

XRF scans of the water service line within the home will be taken, depending on ease of accessibility. Accessibility is at the discretion of the investigator. If there are multiple sections of the service line accessible, one XRF reading may be taken from each accessible section. The water service line location within the home will be photographed if accessible. Any reading over 0.25% for lead will be considered "lead- containing". According to the Reduction in Lead Water Act, the term 'lead free' means— "(A) not containing more than 0.2 percent lead when used with respect to solder and flux; and (B) not more than a weighted average of 0.25 percent lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures" (SWDA 2018).

#### *Other fixtures*

An attempt will be made to visually assess all plumbing fixtures within the home with emphasis on drinking water sources. At the discretion and professional judgment of the study investigator, any plumbing fixture may be scanned via XRF to determine lead content.

#### *Residential soils*

Outdoor soil samples will be collected and evaluated within the property boundaries in targeted areas of bare soil that will include 1) near the foundation of the home at the "drip line", 2) other areas where chipping or weathering of exterior paint might occur (near fences, sheds, etc.), and, bare soil greater than 9 sq. ft., and any identified play areas including sandboxes.

Pursuant to HUD guidelines 7-18: Exterior Painted Components That Should Be Tested Include but are not limited to:

- Air Conditioners Fascias Railing Caps
- Balustrades Floors Rake Boards
- Bulkheads Gutters and Downspouts Sashes
- Ceilings Joists Siding
- Chimneys Handrails Soffits
- Columns Lattice Work Stair Risers and Treads
- Corner boards Mailboxes Stair Stringers
- Doors and Trim Painted Roofing Window and Trim

- Other Exterior Painted Components Include:
- Fences Storage Sheds & Garages
- Laundry Line Posts Swing sets and Other Play Equipment.

*"Each composite sample should consist of subsamples that are of approximately equal bulk and that are collected from 3-10 distinct locations. Subsamples should be collected at least 2-6 feet away from each other if possible (small play areas may not be large enough for this spacing). For non-play areas in both the dripline/foundation area and the rest of the yard, subsamples should be taken from bare soil locations and should be dispersed in a pattern roughly similar to the distribution of the surfaces of bare-soil area throughout the dripline/foundation area and the rest of the yard."*

Soil screening may be conducted by XRF but samples will be collected and sent to a National Lead Laboratory Accreditation Program (NLLAP) - certified laboratory for analysis. At the direction of the study investigator, additional "non-targeted" soil locations will be evaluated (via XRF) to provide a representative overall estimate of lead levels in the exterior soils. No attempts will be made to penetrate through concrete or other permanent barriers that might prevent access to surface soil.

Soil samples may also be collected at targeted areas beyond the residential property boundary if 1) any resident of the home (particularly children) may have spent a significant amount of time at that location and the surface soils are accessible, and/or 2) it has been determined previously that a lead source may have existed at that location. Sampling of non-residential source locations may occur during a separate survey if needed (due to time constraints accessing the homes).

Soils may be wet or frozen during the survey. If soils are covered by snow at the time of the survey a follow up visit will be necessary when the snow cover is gone to continue the assessment and collect the appropriate soil samples.

#### *Interior house dust*

House dust will be collected at selected locations and will include visible dust in window wells, doormats, on upholstery, etc. House dust samples will be collected using 1) HUD and EPA-approved wipe sample techniques in residential dwellings; and 2) vacuum sample techniques (EPA, 2008) in locations at the discretion of the study investigator. Photos of both wipe and vacuum dust sample locations will be collected. House dust from floors and carpeted surfaces will be vacuumed using a procedure consistent with the guidelines of the USEPA , 2008 publication for use in the IEUBK Model. Sampling areas will be determined while at the residence.

Interior Walls will not require sampling using XRF or "wipe" sampling as the results of the sampling do not integrate into the IEUBK inputs. However. XRF samples could be sampled on walls which

demonstrate any chipping flaking or peeling paint. The flaking paint chips will provide an additional source of lead for children residing in the homes.

#### *Porch dust*

Porch dust samples will be collected on all porches serving the home. Porch dust samples will be collected using HUD and EPA-approved dust wipe sample collection techniques. Photos of dust wipe sample locations will be collected.

#### Schedule

It is anticipated that the home surveys can be completed in 6-7 weeks by the sampling/investigator team in the field. As noted above, surveys of potential source area soils (outside of residential property boundaries) could be performed in a separate investigation, depending on time constraints that apply to the surveys of the residential units.

#### References:

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EPA 2018. Protecting Children from Lead Exposure. EPA PUBLICATION #171K18001

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